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Intertemporal and Interspatial Comparisons of Income

The Meaning of Relative Prices

Sultan Ahmad

Harmonizing methods for comparing prices is essential for improving comparisons of outputs over time and space. And a synthesis of methods would reduce the cost of collecting and disseminating relevant information.

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This paper — a product of the Socio-Economic Data Division, International Economics Department — was presented at the meetings of the Allied Social Sciences Associations in Anaheim, California, January 5-7, 1993. Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Elfrida O'Reilly-Campbell, room S7-136, extension 33707 (July 1993, 20 pages).

The conceptual issues confronting compilers of price indices have not changed much over the years. They include the intractability of basic index-number problems, the practical difficulties of sampling and matching prices, and the uncertainties about the appropriate weighting scheme for comparing events in specific locales over time and across locales.

Ahmad considers inconsistencies in some measures of time-to-time and place-to-place comparisons of income. He argues for a method that harmonizes price work across generally recognized national price compilations, such as consumer price indices (CPIs), the International Comparison Programme (ICP), and national accounting.

Modern economies tend to be more open, so relative prices should be more similar, but it is increasingly apparent that price levels and trends can differ considerably even within a nation — particularly those encompassing economically heterogeneous areas.

The global ICP exercise has provided useful insights into the issues involved. At the same time, international comparisons of the type ICP aims to facilitate are now seen as being more sensitive than expected to changes in relative prices. ICP has given little attention to this issue, but there is a rich literature on the subject with respect to CPIs. The common ground for the two logics is essentially national accounts, broadly defined.

Through conceptual and practical work done by the World Bank on the topic, Ahmad suggests that harmonizing the various methods is essential to a proper interpretation of the market signals that prices send to economic agents. He also explains how a better synthesis reduces the overall cost of collecting relevant information and disseminating it to users.

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Inter-Temporal and Inter-Spatial Comparisons of Income: The Meaning of Relative Prices

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Paper presented at

Allied Social Sciences Associations Meetings
Anaheim, California, January 5-7, 1993

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Inter-Temporal and Inter-Spatial Comparisons of Income: The Meaning of Relative Prices[1],[2]

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I. Introduction

1. The inter-spatial indices of prices and outputs generated by the UN International Comparison Programme (ICP) are not always consistent with the inter-temporal indices compiled by national statistical offices. This paper discusses the issues involved and describes what the World Bank is doing about them. Although the inconsistencies are due to a combination of factors ranging from intractable index number problems, problems associated with compiling inter-temporal indices and those related to measurement of inter-spatial indices, the paper concentrates on concepts and practices of ICP. The paper concludes that the inconsistencies would be reduced and the remaining discrepancies better understood if there is harmonization of statistical work related to national accounts, consumer price indices (CPI) and ICP.

2. After brief descriptions of the status of ICP, its methods and World Bank objectives, the paper highlights some inconsistencies, discusses contributing factors and outlines actions designed to deal with them.

II. Current status of ICP

3. The ICP is a UN sponsored program to develop a system of comparing GDP and its components across countries by converting national currency estimates into a common currency, say the US dollar, by purchasing power parity (PPP)[3] rates rather than exchange rates. The program involves collecting prices of 400 to 1,000 comparable items, classified into 150 or more basic headings covering the entire

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[1] This paper is a revised version of "Improving Inter-Spatial and Inter-Temporal Comparability of National Accounts" presented at the Conference on Data Base of Development Analysis, Yale University, May 15-16, 1992.

[2] The author would like to thank Mark R. Rosenzweig of the University of Pennsylvania who reviewed an earlier draft and made helpful comments. While the paper focuses on inconsistencies between inter-spatial and inter-temporal indices of national accounts estimates and ways to improve consistency, Rosenzweig would have liked the paper to include "details on and empirical or practical consequences" of the inconsistencies. These are legitimate concerns of users of ICP data and should be dealt with, perhaps in another paper.

[3] PPP is defined here as the number of units of a country's currency required to purchase the same amounts of goods and services in the country as one dollar would buy in the United States.

gross domestic product (GDP). The price relatives of the basic headings are then aggregated into average price relatives or PPPs for GDP and its various components using GDP expenditure weights. These PPPs are then used as conversion factors which, by equalizing prices in every country, improves international comparability of national accounts as against conversions by exchange rates which do not necessarily reflect relative prices.

4. ICP comparisons are made in two stages: first each region[4] makes its own comparisons, and then the regional numbers are linked together to form the global comparison. The ICP surveys, which are conducted about every five years, have covered 90 countries in one phase or another over the six phases from 1970 to 1990 completed so far[5]. The 1990 survey was confined to OECD and other European countries with the then USSR participating for the first time. However, work is well underway for a global exercise in 1993 which will include comparisons in Africa, Asia, perhaps Latin America also, as well as OECD and other European countries, with many new prospective participants. The most notable prospective newcomers are China and several republics of the Former Soviet Union (FSU).

5. The ICP is often viewed especially by some developing countries as an activity imposed upon countries by international organizations and not too relevant for country policy work. But ICP generates a vast number of internationally comparable observations of prices which span the entire economy, its different geographic regions, urban and rural areas, and formal and informal markets; this price information is potentially very useful for improving indices of prices and outputs, including national accounts, and formulating policies for structural adjustment and resource allocation. The ICP has already become a more or less regular program in the developed countries. The task ahead is to demonstrate to the developing countries the usefulness of the numbers and persuade them to adopt ICP as a part of regular national statistical work.

III. ICP methods in a nutshell

6. ICP moves from the traditional binary comparisons, which are not transitive, to the realm of multilateral comparisons where a premium is paid for transitivity, additivity and base country invariance of the index numbers. For reasons of convenience, ICP concentrates on the expenditure side of GDP rather than on the production side. It collects national annual average prices paid by the final purchaser, takes GDP expenditure data from national accounts and, relying on the identity that expenditure equals price times quantity, obtains estimates of quantity implicitly at the most detailed level, called basic headings, for which expenditure data are available. Using the Geary-Khamis[6] (GK) formula for

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[4] A region may refer to a geographic region such as "Africa," or a group of countries such as the "OECD."

[5] Country coverage of the benchmark surveys in the six phases completed so far is as follows: 10 in phase I for 1970, 16 in phase II for 1973, 34 in phase III for 1975, 60 in phase IV for 1980, 64 in phase V for 1985 and 30 in phase VI for 1990. However, none of the 16 mainland Latin American countries that took part in the 1980 survey was present in the 1985 exercise.

[6] The Geary Khamis aggregation consists of solving a set of (m+n-1) simultaneous equations for where there are m basic headings and n countries, one of which is the base. The system delivers m international prices and n-1 PPPs. PPP of a country is the ratio between expenditure in national currency and expenditure in "international prices", while the "international price" of a basic heading is the quantity

multilateral aggregation, these implicit quantities of every country are then valued at a single set of average prices, called "international prices", thus establishing a parallel with constant price inter-temporal quantity indices. The PPPs are simply the ratios between expenditures in national currencies and the corresponding expenditures in international prices. The PPPs are in effect quantity-weighted average price relatives - or indices - expressed in numbers of units of a country's currency per unit of a base-country currency, say the US dollar. When divided by the prevailing exchange rates, they are indices measuring inter-spatial differences in price levels.

7. The Geary-Khamis is by no means the only aggregation procedure available in the literature; among the alternatives are the EKS, van-Yzeren, Walsh, Implicit Prices, etc.,[7] each with its strengths and weaknesses. Although the GK satisfies conditions of transitivity, additivity across countries and components of GDP, and base country invariance, it has several serious drawbacks. Because of the simultaneous nature of its solutions, the results between two countries are subject to change if countries are added or deleted from the set; ICP seeks to counter this by using super-country weights where the sum of the weights is arbitrarily made equal to world GDP. Also, the GK is particularly vulnerable to the so-called Gerschenkron effect, which results in an upward evaluation of the quantities of countries whose price structures differ significantly from the structure represented by average "international" prices.[8] Since the quantity weighted average prices tend to be closer to the prices of the more affluent countries in the set, the quantity estimates of the less affluent will tend to be relatively high. Although the incidence of Gerschenkron effect has been reduced by regionalizing ICP, the European Communities (EC) prefers to use the EKS method which minimizes this effect. OECD has also published its official 1990 tables using the EKS method, postponing the publication of the GK results for a later date. However, since the EKS is not additive (i.e., estimates of components would not necessarily add up to totals), the GK is still the preferred method in all other regions and at the United Nations Statistical Division (UNSTAT), the global coordinator of ICP. It may be noted that comparisons of countries within the same region with similar price structures are not affected much by changes in the aggregations method.

8. Regionalization of ICP, by segmenting the work, has improved comparisons with neighboring countries as well as made surveys more manageable. However, this has made comparing countries across regions more difficult as the method of linking regions via binary comparisons of "core countries" in each region has not worked too well in the past. A new method of linkage by "core commodities" will be tried in the 1993 round of comparisons.

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weighted average prices of countries when the prices have been made commensurate with each other by converting them to the base country currency by the PPP. Thus PPP and "international prices" need to be determined simultaneously.

[7] See Kravis, Kenessey, Heston and Summers, *A System of International Comparison of Gross Product and Purchasing Power (Baltimore:JHUP, 1975)*, chapter 5, for a discussion of various multilateral methods. See also reports of expert group meetings on ICP methodology, Luxembourg: June 6-10, 1988 (by Eurostat), and Paris: June 14-16, 1989 (by OECD).

[8] See Kravis, et. al., *A system...*, pp. 74, 184.

IV. The ICP and the World Bank

9. With respect to ICP, the objectives of World Bank are to:

a. maximize country participation in ICP by integrating it with national statistical routines, thereby reducing the cost of the exercise and increasing the policy relevance of the numbers;

b. refine methods of extending coverage to non-benchmark countries and years, and

c. disseminate detailed data in machine readable form and promote research in evaluating the usefulness of the numbers for policy decisions.

This paper deals with World Bank approaches related primarily to the first objective, and elaborates on the harmonization of statistical work designed to improve consistency between national accounts and ICP. The paper also focusses on a number of technical issues that need to be addressed at both the global and country levels to enable the objective of integration being met.

V. Inconsistency between national accounts and ICP benchmark estimates

10. Users of ICP data have long recognized the fact that growth rates implicit in two benchmark year estimates are not always consistent with those obtained from national currency constant price series. In the absence of annual benchmark estimates, the conventional method of extrapolating benchmark estimates (expressed in US dollars) to other years is to use growth rates computed from national currency constant price GDP data and adjust the estimates by US inflation rates to express the values in current dollars. Alternatively, one could use the relative rate of inflation between the country in question and US, as measured by implic.. deflators, to extrapolate the base year PPP to the new year and use the resulting PPP to convert current price national currency GDP data to obtain the estimate of the new year in current US dollars. The results of the two methods of extrapolations would be the same, but extrapolations of ICP estimates of one benchmark year to another will not usually match the actual benchmark results.

11. Table 1 summarizes the extent of discrepancies in the results of extrapolating per capita GDP. For the ICP Phase III countries, extrapolated from 1975 to 1980, the average discrepancy in the index of GDP (with US = 100) was 11 percent (when the signs of the discrepancies were ignored), ranging from a negative 13 percent to a positive 34 percent. For estimates from Phase IV to Phase V (1980 to 1985), the average discrepancy was 16 percent, with a range of a negative 46 percent to a positive 35 percent. In both these cases, the estimates were on average higher than the benchmark data. The range of discrepancies in the case of 1985 data extrapolated to 1990 were lower (7 percent) and the range much narrower (-14 to +9 percent) but the countries included in this comparison were also much more homogeneous (only OECD countries) than in the others.

Table
Discrepancies in extrapolations over actual estimates
ICP GDP per capita, US = 100

	1975 to 1980	1980 to 1985	1985 to 1990
Average absolute difference (%)	11	16	7
Range of difference (%)	-13 to +34	-46 to +35	-14 to +9

Source: Annex Tables 1, 2 and 3.

12. It must be noted that this inconsistency is by no means confined to ICP data. As Table 2 shows, using the same sets of countries as in Table 1, the inter-country comparison of per capita income by the World Bank's Atlas method suffers from similar inconsistencies: index of values of a given year extrapolated to a target year by real growth rates do not usually match the direct estimates of the target year. This paper, however, concentrates on problems related to ICP.

Table 2
Discrepancies in extrapolations over actual estimates
Atlas GNP per capita, US = 100

	1975 to 1980	1980 to 1985	1985 to 1990
Average absolute difference (%)	18	47	30
Range of difference (%)	-30 to +94	0 to +99	0 to -43

Source: Annex Tables 4, 5 and 6.

13. Both ICP and Atlas estimates reflect current year data, with its own brand of relative price indices (i.e., the conversion factors: PPPs in ICP and average exchange rates in Atlas) appropriate for the year; an attempt to impose a fixed price structure of a base year to other years will indeed cause discrepancies in cases where there have been significant changes in relative price structures. Similarly, in inter-country comparisons of the ICP type, since the estimates are based on the average price structure of the countries being compared, one should take a critical look at estimates of countries whose price structures are significantly different from the average. For analysts, ICP provides a vast wealth of price and expenditure data which would permit them to recognize significant differences in relative prices both within and across countries and guard them against drawing unwarranted conclusions. For the compilers of ICP data, an examination of the detailed data would point up areas of exceptional errors and inconsistency in matching and sampling of items and should trigger corrective action to minimize such errors. The following section presents some evidence of the kind of problems the analysts and compilers should be aware of.

VI. Some evidence of relative prices in ICP

14. Chart 1 provides two pictures which compare respectively the relative price structure of Turkey and Austria vis-a-vis USA for 1985. For each of the 152 basic headings (which sum up to GDP), the price relative was divided by the average overall price relative (PPP) for GDP as a whole. Thus points above or below the horizontal line at 1.0 signifies higher or lower average price of the basic heading than the overall price level in the country, compared with USA. The curve for Turkey shows a much wider range of variation than for Austria signifying that analysts should be more confident about comparative levels of per capita income for Austria and USA than for Turkey and USA as measured by these data. For compilers, there would be much more scope for correcting errors of mismatch of items in Turkey than in Austria.

15. Chart 2 presents a comparison of real quantities of USSR and Hungary in 1985 and 1990. The 1985 data were drawn from a study by the Council of Mutual Economic Assistance (CMEA) in Moscow while the 1990 data were taken from ICP surveys coordinated by Austria. For each of the major headings, the real quantity estimate of USSR is divided by the corresponding estimate for Hungary. This is done separately for 1985 and 1990 and the ratio of the two (1990/1985) (in percentage terms) is plotted in Chart 2. The chart shows that comparative structures of real quantities between Hungary and USSR were very different in 1985 and 1990. Most analysts would find it hard to believe that this indeed was the case. Again the compilers should look for possible areas of mismatch of items and errors in relative prices.

16. Chart 3 presents a worst case scenario. It plots the price relative (ruble to schilling) of individual items divided by the estimated overall PPP (ruble to schilling) for 1990. The chart shows that individual item prices in USSR are sometimes sixty times higher and sometimes 30 times lower than in Austria. The standard deviation of the array of price ratios is 184 percent! While some the extreme values may be true, the widespread nature of the variation point to the difficulty of determining what constitutes market prices in a command economy and how to compare items that are not available in each other's markets. Again this shows opportunities for compilers to improve the comparisons and for analysts to be on guard about making conclusions based on these data.

17. Work in progress at the World Bank shows that national annual average prices smooth out vast differences in prices in different regions of the country or in markets types, especially for countries with economically heterogenous areas. Detailed price data generated by ICP for rural or urban areas or for formal or informal markets are expected to provide analysts with opportunities to analyze differences within as well as across countries and help formulate structural adjustment policies.

VII. Proposed actions for reducing inconsistencies

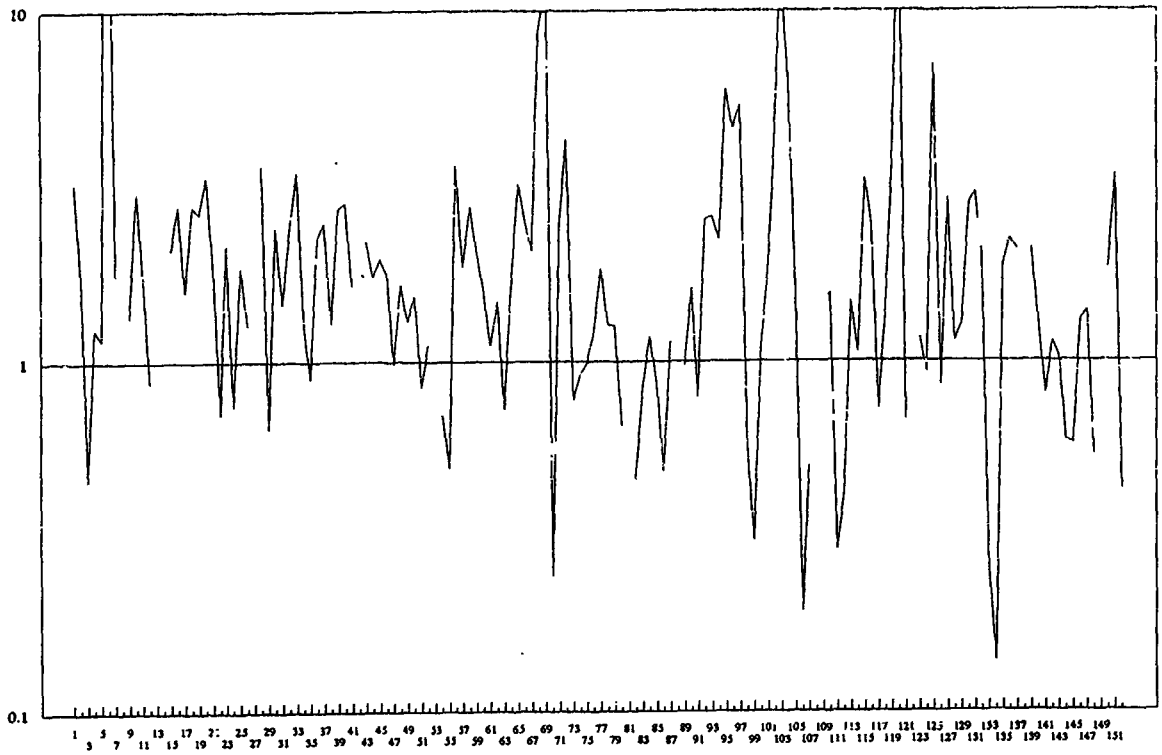
18. There is a certain amount of incomparability among the phases of ICP resulting from changes in country coverage, weighting pattern, selection and pricing of items, formulas for computing basic heading price relatives and aggregations, introduction of regionalization and the method of regional linkage. Impact of these issues is likely to be reduced as country coverage becomes more or less complete and ICP methods and practices, especially with respect to inter-regional linkage, become stable.

19. Some of these discrepancies are inevitable, however. Conceptually, inter-temporal quantity indices keep prices constant and let quantities vary. In ICP, as both quantities and prices are allowed to

CHART 1

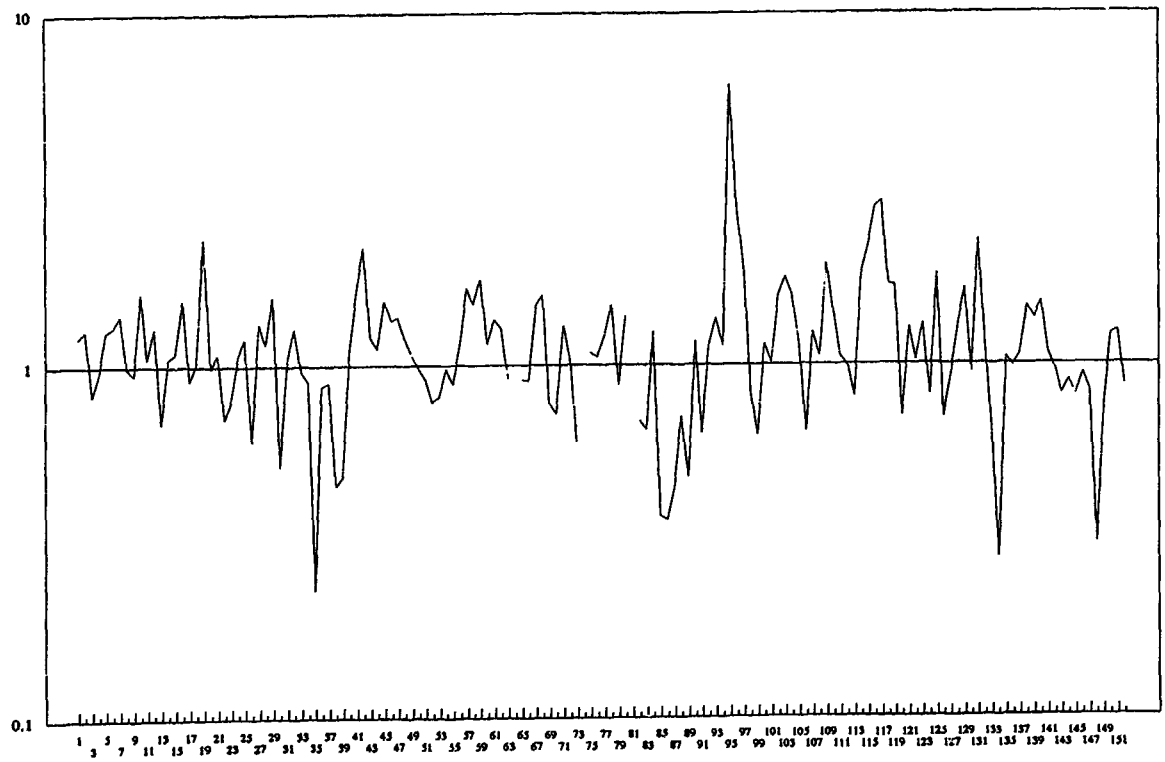
Relative Turkish prices for 152 commodity groups

Turkey-USA



Relative Austrian prices for 152 commodity groups

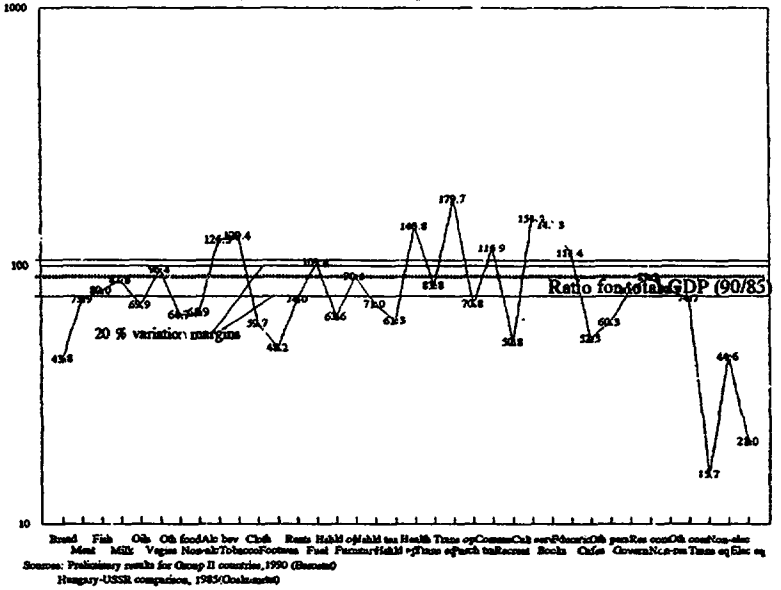
Austria-USA



Quantities	1	2	3	4	5	6	7
GroupII Comparison	USSR	Hungary	Hungary	RatioU/H	RatioU/H	DifferenceDifference	
Austria = 100	1990	1990	1985	1990	1985	4 to 5	2 to 3
1 Bread&cereals	86	39.9	91.2	215.5	103	209.3	43.8
2 Meat	45.3	60.8	82.3	74.5	76.5	97.4	73.9
3 Fish	200.8	20.8	26	965.4	434	222.4	80.0
4 Milk,cheese&eggs	81.9	67.6	77	121.2	92.3	131.3	87.8
5 Oils&fats	41.5	41.4	59.2	100.2	74.4	134.7	69.9
6 Fruits,vegies&potatos	41.5	50.4	52.3	82.3	123.1	66.9	96.4
7 Other food	26	35.5	54.9	73.2	81.9	89.4	64.7
8 Non-alcoholic beverages	10.9	26.5	40.2	41.1	25.1	163.9	65.9
9 Alcoholic beverages	53.4	67.9	54.1	78.6	79.5	98.9	125.5
10 Tobacco	51.2	81.4	62.9	62.9	68.6	91.7	129.4
11 Clothing	40.5	17.5	29.3	231.4	115.8	199.9	59.7
12 Footwear	49.8	22.5	46.7	221.3	157.5	140.5	48.2
13 Rents	10.7	37	50	28.9	85.3	33.9	74.0
14 Fuel&power	36.9	81.9	80	45.1	59.2	76.1	102.4
15 Furniture	20.5	19.9	31.3	103.0	80.8	127.5	63.6
16 Household textiles	31.7	39.9	44.1	79.4	33.8	235.1	90.5
17 Appliances	12.2	36.7	51.7	33.2	35	95.0	71.0
18 Other hshld goods&serv	58.4	44.5	72.6	131.2	70.4	186.4	61
19 Medical care	65.5	95.3	67.7	68.7	138	49.8	140.6
20 Transport eq	2.9	13.4	16	21.6	59.4	36.4	83.8
21 Tranport operation	9.9	32.7	18.2	30.3	22.9	132.2	179.7
22 Purchased transp service	100.4	45.6	64.4	220.2	185.8	118.5	70.8
23 Communication	28.1	18.2	15.7	154.4	96.8	159.5	115.9
24 Recreational eq	13.4	19.2	37.8	69.8	49.9	139.9	50.8
25 Recreational&cultural se	26.2	96.6	63.8	27.1	42.8	63.4	151.4
26 Printing materials	87.8	90.4	63.1	97.1	182.7	53.2	143.3
27 Education	123.9	82.3	73.9	150.5	94	160.2	111.4
28 Restaurants,hotels	25.4	19.3	36.9	131.6	132.8	99.1	52.3
29 Other goods&services	29.9	32.4	53.7	92.3	55.5	166.3	60.3
30 Government consumptio	132.4	51.7	64.6	256.1	216.4	118.3	80.0
31 Residential buildings	73.1	43.5	48.4	168.0	149.3	112.6	89.9
32 Non-residential buildings	120.2	33.1	41.2	363.1	324.6	111.9	80.3
33 Other construction	117.3	42	56.2	279.3	125.9	221.8	74.7
34 Transport equipment	42.9	4.1	26.1	1046.3	605.5	172.8	15.7
35 Non-electrical machinery	30.6	13.1	29.4	233.6	193.7	120.6	44.6
36 Electrical machinery	17.6	4.5	21.4	391.1	142.7	274.1	21.0
Gross Domestic Product	46.6	40.7	47.2	114.5	121.9	93.9	86.2

Hungary-Austria: difference between 1985&1990

Hungary-Austria relative quantities in 1985=100



USSR-Hungary: difference between 1985&1990

USSR/Hungary relative quantities in 1985=100

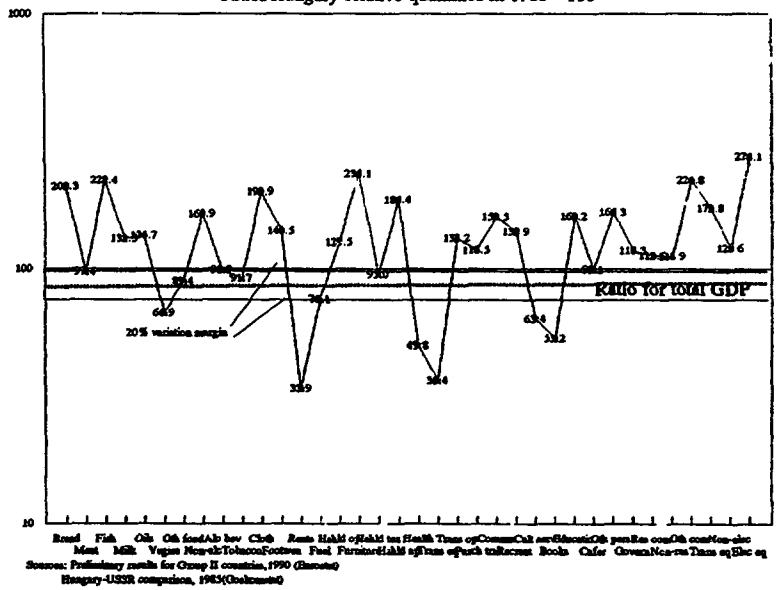
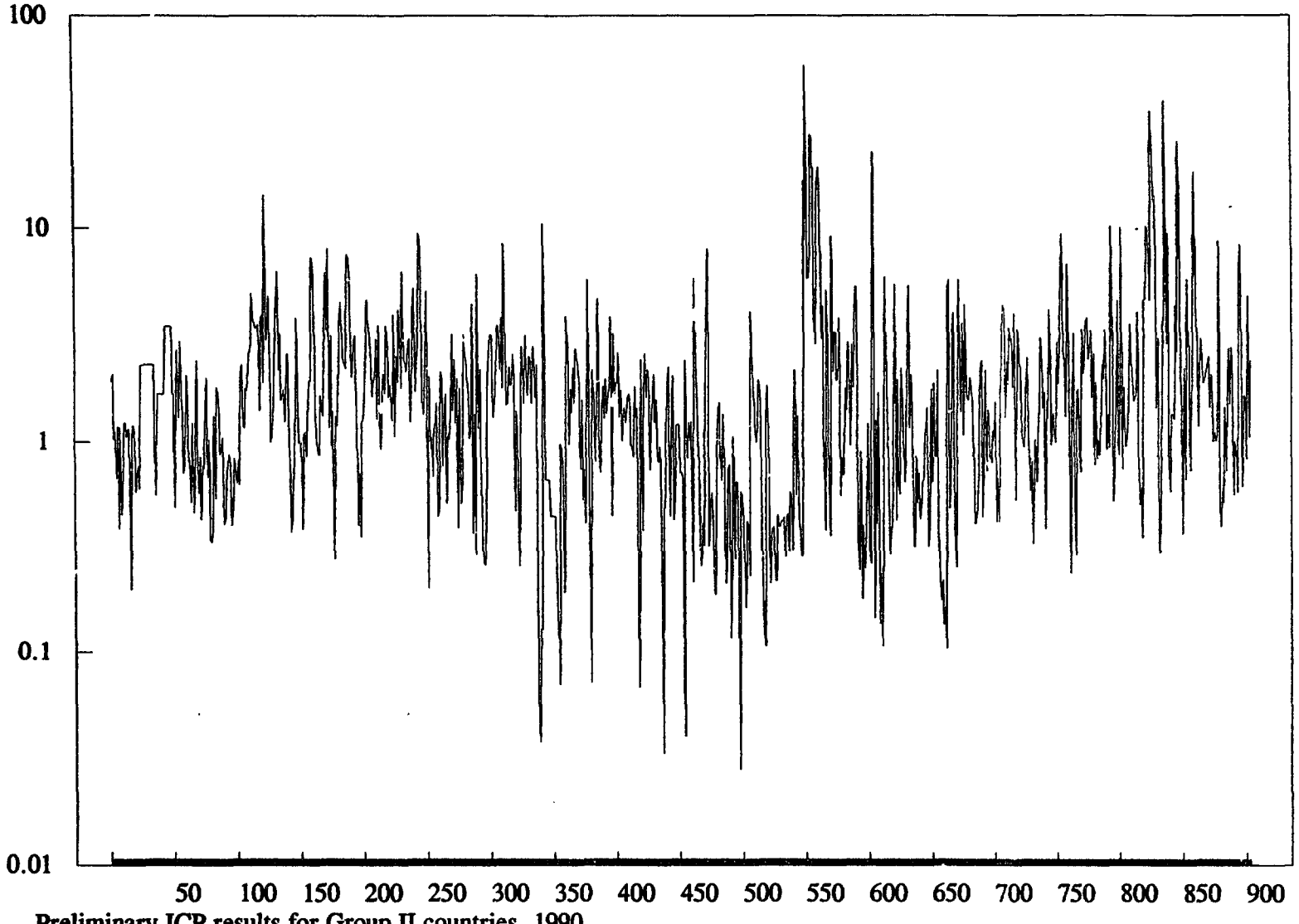


CHART 2

Relative Soviet prices of 903 commodities

(Austria = 1.00)



Preliminary ICP results for Group II countries, 1990
Standard deviation 184.1%

vary from one benchmark to another, the vector of international prices differs from one benchmark to another. In this sense, as mentioned earlier, comparing two bench mark estimates is like comparing two current price values; naturally the growth rate computed from them is not expected to match the one computed from constant price values. We discuss below some of the other factors that may be responsible for the discrepancies, and propose actions to reduce them where possible - through harmonization of price work, improvement in GDP expenditure data, and better documentation, accessibility and dissemination of data.

A. Harmonization of Price Work

20. The most important reason for the discrepancy is that the prices observed in ICP are often not consistent with those underlying national accounts, resulting in estimates of implicit quantities which are different from those underlying national accounts. Since prices are the crux of the ICP exercise, we discuss at some length the steps needed to harmonize the price work in national accounts, CPI and ICP.

21. As mentioned earlier, PPPs are weighted averages of price relatives expressed in different currencies. The requirements of price data for ICP are:

a. The items priced and the prices collected must be representative of the expenditure pattern of the country concerned.

b. The sample of prices must be amenable to computation of correct estimates of national annual averages.

c. The annual average prices should be consistent with national accounts, so that both SNA and ICP estimates represent the same physical quantities embodied in the national accounts aggregates.

d. The items priced should be as comparable as possible across countries.

22. Since it is not possible to fully satisfy each condition, the art of ICP is choosing the right trade-offs among them. In the Bank's view, too little attention has been given to the first three requirements. It is possible that comparability, or correct alignment of item prices across countries, is the key element in well developed economies where market prices prevail. However, that is clearly not the case when one is dealing with economies where price controls are prevalent and there is only limited diversity of goods and services. It is this issue of emphasis, perhaps, that distinguishes the Bank's approach to ICP from others.

i. Representativeness

23. If the items selected for ICP are not representative of the country concerned, the country will not be enthusiastic about collecting the prices which will have little policy relevance. Also, the cost of collecting representative prices will be less partly because existing price collection mechanisms can be used or readily extended but also because it is inherently harder to find unrepresentative items.

24. The prices should be representative of a country's expenditure pattern both in the selection of specifications and in the sampling of markets and outlets. The guiding principle in ICP is to price items that are volume sellers in quality and packaging, and choose markets and outlets that account for most

expenditures on the item. Most nationally compiled price indices, notably the CPI, follow this principle, and the first place that ICP should look for a list of representative items would be the lists of specifications included in these indices. However, the CPI list, which covers consumption, may refer to a particular location (capital city) or a target group of consumers (low income families), and may require additions and deletions to make it representative of the entire GDP expenditure which is the focus of ICP. Similarly for the other indices such as the WPI (wholesale price index), construction price index, labor cost index, etc. - items selected for ICP should have a maximum representation of the country as a whole rather than specific location or group of people.

25. It is unlikely, however, that all the items needed for ICP can be found in the lists of specifications of CPI plus other existing index number programs. Since ICP seeks to measure place-to-place differences in prices, it is much more concerned about detailed identification of item characteristics than national price indices that are mainly used to measure time-to-time changes. For measuring time-to-time price changes, countries may use sampling techniques that allow price collectors to choose specific items for each surveyed outlet without much concern about item specifications beyond continuous reference to the same items/outlet mix overtime. This does not mean that the outcome is less representative nor that the items chosen are less comparable. The documentation necessary to answer such questions has been stripped from the prices. *One step in the harmonization process will be to develop ways for a sample of price collectors to feedback fuller descriptions of all items priced in various places in order to create a pool of specifications from which ICP items could be selected.*

ii. Sampling techniques and Computation of national annual averages

26. In ICP, national annual average prices are applied to national annual expenditures to obtain estimates of quantities implicitly. It is difficult, if not impossible, to compute national averages if the CPI is based entirely on outlet specific items without any mechanism to put them on a comparable basis. One recourse to ensuring this is the quality correction factors discussed later. Another would be to require each outlet to price some nationally established specifications under each basic heading of consumption - a set of *national* "core commodities", so to say - for linking outlets and markets within the country. We propose to work with experts from the US Bureau of Labor Statistics (BLS) to delve deeper into the sampling issue.

27. Since the sample of prices is likely to be different in different countries, and expenditure weights at the level of individual items are not usually available, mismatching of weights to items is quite possible; in which case comparisons based on national averages may be misleading. As a minimum, there seems to be a strong case for analyses of how much such higher-level averages are influenced by the imputations needed to link available price and expenditure details. This suggests that it may be better to compute price relatives by types of outlets and markets first and then average the price relatives, rather than average the prices first and then compute the price relatives. *A second step in the harmonization process will be for countries to retain as much of the details of prices by geographic regions, formal or informal markets, rural or urban areas, etc. in order to make it possible to experiment with various options.*

28. As ICP and CPI indices both use expenditure weights, *a third step would be for countries to adopt uniform expenditure classifications of the type proposed by ICP and stratify their CPI price samples accordingly so as to make the components directly comparable across countries.*

iii. Consistency with national accounts

29. As mentioned earlier, ICP observes prices and estimates quantities implicitly using the basic accounting identity: Expenditure = Quantity x Price. The expenditures are those estimated under the SNA (with the specific and fairly mechanical reclassification of collective expenditures on health and education). If the average prices are not consistent with the prices used in national accounting, the quantity comparisons will be inaccurate. Thus, for instance, if national accounts are based on controlled prices rather than market prices, the ICP prices should also be the controlled prices. This is because although the quantity comparisons are made via the PPP, it is the comparison of real quantities which is the ultimate goal of ICP.

30. In many countries the CPI is often used for linking current and constant price estimates of various components of consumption. *A fourth step in the harmonization process would be to establish mechanisms of collecting prices which would serve the needs for CPI, national accounts as well as ICP.* The Bank has worked in Nigeria to incorporate as many of ICP items as possible into the country's CPI, and in Bangladesh to help set up a price collection mechanism based on ICP work to develop constant price deflators.

31. Since countries usually price a different sub-set of items included in a basic heading, the average price relative for the basic heading can only represent what is priced. For instance, for rice, one country may price mostly long grain rice sold loose in a predominantly informal market, and another may price mostly "basmati" rice in 1-kg bags sold in city supermarkets. The implicit quantities derived from these prices would thus embody a potentially different quality mix, even though each country's prices may be consistent with their national accounts. This kind of inconsistency can be reduced by improving comparability which is discussed below.

iv. Comparability and quality correction

32. For the purposes of ICP, items must be comparable across countries; truly unique products and services are not usable in ICP, because by definition there will be nothing with which to compare them. And the items priced should be comparable in unit, quality, packaging and conditions of sale. For example, the price of a kilogram of peanuts sold in one-ounce packages in stadiums in one country would not be comparable to the price of a kilogram of peanuts sold in kilogram-cans in super markets in another.

33. But a robust PPP requires a larger number of matching items. The more rigid the determination of "uniqueness," the less robust the PPP. Hence, ICP experts often make simple conversions, say taking half the price of two ounce-packages of peanuts in one country as comparators for one-ounce packages elsewhere.

34. However, easily compared items, such as American brand-named processed cheese, are simply not representative for many countries. It is necessary to strike an adequate balance between the conflicting requirements of representativeness and comparability. Preliminary investigation shows that it is difficult to find exact cross-country matches of items in CPI baskets; the items are usually described very broadly, leaving out differences in essential elements of quality which bear on prices. At the same time, the comparable items that are implicitly the bridges between representative items, with traditional ICP methods, cannot carry much weight when they refer to specialty goods (perhaps for countries on each side of the bridge) that may be subject to different national pricing regimes (e.g. not controlled like

representative items). *A further step in the harmonization process will be to develop quality correction factors to ensure a closer match with regularly collected prices and minimize the need for specifying entirely new items requiring special price collection.*

35. The East European countries, participating in ICP through binary comparisons with Austria, were the first to recognize the need for quality correction and to develop a mechanism for implementing it. The Austrian Central Statistical Office (ACSO) has assumed a leadership role in this area. Although a potato is a potato at some level of abstraction, it may differ from market to market in packaging, return facility, associated services, and the like, all of which would add to price but which would be viewed as an element of quantity rather than price if corrections for these quality aspects are not made. The task is to minimize the element of arbitrariness in the decisions and to agree in advance how the corrections will be made. We believe some quality correction mechanism should be established for all regions. At the same time, we are beginning to explore (with colleagues at the US Bureau of Labor Statistics as well as the ACSO) better ways to catalog the "characteristicity" of items to be priced with the immediate goal being better identification of the inference process underlying the country- product dummy (CPD) and similar gap-filling methods.

36. The harmonization process cannot be completed overnight and will require the concerted effort of international organizations as well as national governments. We propose to make case studies of the harmonization process with some selected countries from Africa, Asia and Latin America for the purpose of developing guidelines for implementation.

B. Improvement of GDP expenditure data

37. In most countries consumption, which is the largest component of GDP expenditure, is usually estimated as a residual and ICP details at the basic heading level is derived on an ad hoc basis. Understandably, countries concentrate on the production side to develop their basic national accounts; but time has come for countries to pay more attention to the expenditure side of national accounts which are needed in dealing with poverty alleviation and structural adjustment policy issues.

38. One action the World Bank has taken in this respect is to make desk estimates of GDP expenditure at the same level of detail as required by ICP for every country (regardless of ICP participation) and pass them on to countries to improve upon them and maintain them on a regular basis. It is hoped that this will trigger an interest in countries to make the estimates of expenditure directly from price and quantity observations, improving the quality of national accounts and at the same time making it easier for them to supply the same prices to ICP as they use in expenditure estimates. This World Bank exercise is expected to be completed in 1992.

C. Improving global linkage: the "core commodity" approach

39. Since each regional comparison is based on its own average price structure, they need to be linked together globally to allow comparisons across the regions. In the last two phases, the linking was done by the method of "core countries", in which several countries from each region, designated as "core countries", collected additional prices to match those in other regions. Binary comparisons between countries in different regions provided linking factors with which regional results were adjusted. The process did not work too well because of the lack of an adequate number of countries volunteering to take up the additional burden of work. Also the choice of a different core country would give a different link as it would generate different detailed bi-lateral PPPs, raising questions about advisability of using a

"core" country because it is willing to be one rather than that it is optimal. We are now supporting the core commodity approach in which a list of "core" items will be priced in every country. These items will provide the links between regions. The process will distribute the burden of work to all participants and would not be viewed as a separate exercise. The details of this proposal are still being discussed.

D. Development of ICP software and dissemination of data

40. The ICP generates average prices of about 400 to 800 items per country. Each of these national averages is based on sometimes hundreds of observations in various markets and outlets all over the country - urban or rural, formal or informal. All this detail needs to be captured and be available to users. Two hurdles have to be overcome: countries should have the computer hardware and software to process these data themselves, and the shroud of confidentiality should be lifted from as much of this information as possible. The World Bank is committed to developing a PC-based portable software, and working with the countries and various international organizations to increase the amount of data that should be in the public domain. The Bank is collaborating with EUROCOST in Luxembourg to develop ICP-software which is expected to be ready for the next round of surveys in 1993. We have also begun making the published data available to users in diskettes using our *STARS* software. Also, to promote discussion of technical issues and minimize international travel, we are developing an ICP electronic mail network, elements of which are already working.

41. In order to facilitate speedy processing of data and bring them closer to country policy makers, there should be regional processing centers for each region. Eurostat has been doing the work for Europe, Africa and some countries in the Caribbean. The ESCAP seems to be ready to do the Asian comparison. ECLAC supported by IDB is expected to take on the responsibility for Latin America. Austria has been coordinating the work in Eastern European countries and the OECD has been linking its member countries with those of Europe. The UNSTAT will coordinate the global comparison. Participating countries would be expected to work closely with the regional processing centers as well as the UNSTAT. The regional processing centers should be fully operational by 1993 and the first set of results should begin to flow in 1994.

VIII. Concluding remarks

42. The ICP's objective of developing a system of comparing national accounts internationally on a consistent basis has been more or less adopted by the developed countries (OECD, EC); the work outlined here is expected to lead the developing countries in that direction. We believe it is feasible as well as desirable to harmonize the price work for national accounting, CPI and ICP, and to improve expenditure details which will have the added benefit of increasing consistency between various inter-temporal measures and the inter-spatial measures provided by ICP.

43. The World Bank is working in support of UNSTAT and various national and international organizations to integrate ICP with national statistical routines and develop the necessary infra-structure (computing facilities, communication network) to facilitate its implementation. The base year for the next phase of ICP will be 1993 and the various organizations, working closely together, should be able to bring out the first estimates in 1994. We are particularly interested in the work of Austria with the East European countries because how these countries cope with the transition is of immense interest to policy makers and provide an empirical basis to the development of economic thinking.

Comparison of Extrapolated and Actual Per Capita GDP in International Dollars
Based on PPP Conversion, 1980

	Actual $I 1975 1	Actual US=100 1975 2	Extrapolated $I 1980 3	Extrapolated US=100 1980 4	Actual $I 1980 5	Actual US=100 1980 6	Difference (%) Col.4 over col.6 7
1 Austria	4,995	69.6	8,520	73.8	8,625	75.3	-2
2 Belgium	5,574	77.7	9,320	80.7	9,436	82.4	-2
3 Brazil	1,811	25.2	3,220	27.9	3,349	29.3	-5
4 Colombia	1,609	22.4	2,710	23.5	2,838	24.8	-5
5 Denmark	5,911	82.4	9,560	82.8	9,831	85.9	-4
6 France	5,877	81.9	9,700	84.0	9,780	85.4	-2
7 Germany	5,953	83.0	10,160	88.0	10,200	89.1	-1
8 Hungary	3,559	49.6	5,970	51.7	4,632	40.5	28
9 India	470	6.5	710	6.1	570	5.0	23
10 Ireland	3,049	42.5	5,150	44.6	5,480	47.9	-7
11 Italy	3,861	53.8	6,920	59.9	7,788	68.0	-12
12 Japan	4,907	68.4	8,500	73.6	8,414	73.5	0
13 Kenya	470	6.5	760	6.6	637	5.6	18
14 Korea, Rep.	1,484	20.7	2,890	25.0	2,583	22.6	11
15 Luxembourg	5,883	82.0	9,410	81.5	10,626	92.8	-12
16 Malawi	352	4.9	560	4.8	415	3.6	34
17 Netherlands	5,397	75.2	8,580	74.3	9,316	81.4	-9
18 Pakistan	590	8.2	990	8.6	1,097	9.6	-11
19 Philippines	946	13.2	1,640	14.2	1,740	15.2	-7
20 Spain	4,010	55.9	6,010	52.0	6,353	55.5	-6
21 Sri Lanka	668	9.3	1,140	9.9	1,226	10.7	-8
22 United Kingdom	4,588	63.9	7,260	62.9	8,253	72.1	-13
23 United States	7,176	100.0	11,550	100.0	11,447	100.0	0
24 Uruguay	2,844	39.6	4,970	43.0	4,259	37.2	16
25 Yugoslavia	2,591	36.1	4,830	41.8	4,042	35.3	18
26 Zambia	738	10.3	930	8.1	730	6.4	26
					Average		3
					Abs. average		11
					Range		-13 to +34

Source: 1975 and 1980 actuals are from ICP Phase III and Phase IV reports respectively. 1980 estimated values are derived by extrapolating 1975 actuals by per capita GDP growth rates computed from constant price national accounts data and scaling up the results by US inflation measured by implicit GDP deflator.

ANNEX TABLE: 2

Comparison of Extrapolated and Actual Per Capita GDP in International Dollars
Based on PPP Conversion, 1985

	Actual $I 1980	Actual US=100 1980	Extrapolated $I 1985	Extrapolated US=100 1985	Actual $I 1985	Actual US=100 1985	Difference (%) Col.4 over col.6
	1	2	3	4	5	6	7
1 Austria	8,630	75	11,780	73	10,900	66	11
2 Belgium	9,440	82	12,550	78	10,670	65	21
3 Botswana	1,590	14	2,790	17	2,670	16	7
4 Cameroon	910	8	1,420	9	2,720	16	-46
5 Canada	11,620	101	16,400	102	15,260	93	11
6 Cote d'Ivoire	1,370	12	1,350	8	1,710	10	-19
7 Denmark	9,830	86	14,350	90	12,230	74	21
8 Ethiopia	280	2	320	2	300	2	10
9 Finland	8,640	75	12,450	78	11,150	69	12
10 France	9,780	85	13,200	82	11,430	69	19
11 Germany	10,200	89	13,910	87	12,170	74	18
12 Greece	5,100	45	6,760	42	5,860	36	19
13 Hong Kong	7,170	63	11,140	69	10,200	62	12
14 Hungary	4,630	40	6,520	41	5,140	31	30
15 India	570	5	850	5	750	5	17
16 Ireland	5,480	48	7,650	48	6,740	41	17
17 Italy	7,790	68	10,560	66	10,830	66	0
18 Japan	8,410	73	12,520	78	11,800	72	9
19 Kenya	640	6	770	5	990	6	-20
20 Korea, Rep.	2,580	23	4,640	29	3,980	24	20
21 Luxembourg	10,630	93	15,330	96	13,420	81	18
22 Madagascar	570	5	590	4	630	4	-4
23 Malawi	420	4	500	3	630	4	-18
24 Mali	340	3	390	2	360	2	11
25 Morocco	1,200	10	1,590	10	2,370	14	-31
26 Netherlands	9,320	81	12,250	76	11,260	68	12
27 Nigeria	890	8	860	5	980	6	-10
28 Norway	11,330	99	16,840	105	13,910	84	25
29 Pakistan	1,100	10	1,680	10	1,340	8	29
30 Philippines	1,740	15	1,850	12	1,790	11	6
31 Poland	4,320	38	5,320	33	4,040	24	35
32 Portugal	3,830	33	4,990	31	5,570	34	-8
33 Senegal	690	6	880	5	1,330	8	-32
34 Spain	6,350	55	8,460	53	7,590	46	15
35 Sri Lanka	1,230	11	1,890	12	1,850	11	5
36 Tanzania	360	3	410	3	420	3	0
37 Tunisia	1,990	17	2,760	17	3,450	21	-18
38 United Kingdom	8,250	72	11,580	72	10,900	66	9
39 United States	11,450	100	16,030	100	16,490	100	0
40 Yugoslavia	4,040	35	5,090	32	4,810	29	9
41 Zambia	730	6	800	5	940	6	-12
42 Zimbabwe	890	8	1,170	7	1,680	10	-28
					Average		4
					Abs. average		16
					Range		-46 to +35

Source: 1980 and 1985 actuals are from ICP Phase IV and Phase V (global) reports respectively. 1985 estimated values are derived by extrapolating 1980 actuals by per capita GDP growth rates computed from constant price national accounts data and scaling up the results by US inflation measured by implicit GDP deflator.

ANNEX TABLE: 3

Comparison of Extrapolated and Actual Per Capita GDP in International Dollars
Based on PPP Conversion, 1990

	Actual $I 1985 1	Actual US=100 1985 2	Extrapolated $I 1990 3	Extrapolated US=100 1990 4	Actual $I 1990 5	Actual US=100 1990 6	Difference (%) Col.4 over col.6 7
1 Australia	11,720	71	14,430	67	16,000	75	-10
2 Austria	10,900	66	14,610	68	16,520	77	-12
3 Belgium	10,670	65	14,520	68	16,350	76	-11
4 Canada	15,260	93	19,700	92	19,190	89	2
5 Denmark	12,230	74	15,420	72	16,790	78	-8
6 Finland	11,460	69	15,670	73	16,490	77	-5
7 France	11,430	69	15,340	71	17,380	81	-12
8 Germany	12,170	74	16,240	75	18,220	85	-11
9 Greece	5,860	36	7,350	34	7,330	34	-0
10 Ireland	6,740	41	9,910	46	10,620	50	-7
11 Italy	10,830	66	14,640	68	15,950	74	-8
12 Japan	11,800	72	16,950	79	17,660	82	-4
13 Luxembourg	13,420	81	18,930	88	19,290	90	-2
14 Netherlands	11,260	68	14,650	68	15,710	73	-7
15 New Zealand	10,050	61	11,670	54	13,560	63	-14
16 Norway	13,910	84	16,800	78	16,050	75	4
17 Portugal	5,570	34	7,990	37	8,750	41	-9
18 Spain	7,590	46	10,970	51	11,740	55	-7
19 Sweden	12,680	77	16,090	75	17,040	79	-6
20 Turkey	3,600	22	5,060	24	4,630	22	9
21 United Kingdom	10,900	66	14,790	69	15,880	74	-7
22 United States	16,490	100	21,510	100	21,450	100	0
					Average		-6
					Abs. average		7
					Range		-14 to +9

Source: 1985 and 1990 actuals are from ICP Phase V (Global) and Phase VI (OECD) reports respectively. 1990 estimated values are derived by extrapolating 1985 actuals by per capita GDP growth rates computed from constant price national accounts data and scaling up the results by US inflation measured by implicit GDP deflator.

Comparison of Extrapolated and Actual Per Capita GNP in US Dollars
Based on Atlas Conversion, 1980

	Actual US$ 1975 1	Actual US=100 1975 2	Extrapolated US$ 1980 3	Extrapolated US=100 1980 4	Actual US$ 1980 5	Actual US=100 1980 6	Difference (%) Col.4 over col.6 7
1 Austria	4,730	63.9	8,070	67.8	10,000	83.2	-19
2 Belgium	5,930	80.1	9,910	83.2	12,160	101.2	-18
3 Brazil	1,070	14.5	1,900	16.0	2,070	17.2	-7
4 Colombia	550	7.4	930	7.8	1,200	10.0	-22
5 Denmark	6,900	93.2	11,160	93.7	13,150	109.4	-14
6 France	5,990	80.9	9,890	83.0	11,890	98.9	-16
7 Germany	6,666	90.1	11,370	95.5	13,270	110.4	-14
8 Hungary	NA	NA	NA	NA	NA	NA	NA
9 India	160	2.2	240	2.0	240	2.0	1
10 Ireland	2,640	35.7	4,460	37.4	5,060	42.1	-11
11 Italy	3,690	49.9	6,610	55.5	7,500	62.4	-11
12 Japan	4,520	61.1	7,830	65.7	9,840	81.9	-20
13 Kenya	230	3.1	370	3.1	420	3.5	-11
14 Korea, Rep.	580	7.8	1,130	9.5	1,620	13.5	-30
15 Luxembourg	7,460	100.8	11,940	100.3	14,940	124.3	-19
16 Malawi	120	1.6	190	1.6	180	1.5	7
17 Netherlands	6,000	81.1	9,540	80.1	12,030	100.1	-20
18 Pakistan	130	1.8	220	1.8	290	2.4	-23
19 Philippines	340	4.6	590	5.0	650	5.4	-8
20 Spain	2,770	37.4	4,150	34.8	5,370	44.7	-22
21 Sri Lanka	290	3.9	500	4.2	260	2.2	94
22 United Kingdom	3,900	52.7	6,170	51.8	7,980	66.4	-22
23 United States	7,400	100.0	11,910	100.0	12,020	100.0	0
24 Uruguay	1,330	18.0	2,330	19.6	2,720	22.6	-14
25 Yugoslavia	1,380	18.6	2,570	21.6	3,250	27.0	-20
26 Zambia	550	7.4	690	5.8	600	5.0	16
					Average		-9
					Abs. Average		18
					Range		-30 + 94

Source: Actual data for 1975 and 1980 are from current World Bank files. 1975 Atlas values are extrapolated to 1980 by per capita GDP growth rates computed from constant price national accounts and scaling up by US inflation.

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ANNEX TABLE: 5

Comparison of Extrapolated and Actual Per Capita GNP in US Dollars
Based on Atlas Conversion, 1985

	Actual US$ 1980 1	Actual US=100 1980 2	Extrapolated US$ 1985 3	Extrapolated US=100 1985 4	Actual US$ 1985 5	Actual US=100 1985 6	Difference (%) Col.4 over col.6 7
1 Austria	10,000	83	13,660	81	9,100	54	51
2 Belgium	12,160	101	16,170	96	8,280	49	96
3 Botswana	870	7	1,530	9	1,050	6	46
4 Cameroon	760	6	1,190	7	820	5	46
5 Canada	10,610	88	14,980	89	14,230	84	6
6 Cote d'Ivoire	1,160	10	1,150	7	660	4	75
7 Denmark	13,150	109	19,200	114	11,380	67	69
8 Ethiopia	120	1	130	1	110	1	19
9 Finland	10,130	84	14,590	87	11,040	65	33
10 France	11,890	99	16,050	95	9,810	58	64
11 Germany	13,270	110	18,090	107	10,916	65	66
12 Greece	4,380	36	5,810	35	3,700	22	57
13 Hong Kong	5,220	43	8,110	48	6,120	36	33
14 Hungary	1,930	16	2,720	16	1,940	11	41
15 India	240	2	360	2	290	2	25
16 Ireland	5,060	42	7,060	42	4,940	29	43
17 Italy	7,500	62	10,170	60	7,750	46	32
18 Japan	9,840	82	14,640	87	11,430	68	28
19 Kenya	420	3	500	3	310	2	62
20 Korea, Rep.	1,620	13	2,910	17	2,340	14	25
21 Luxembourg	14,940	124	21,550	128	14,080	83	54
22 Madagascar	430	4	440	3	310	2	42
23 Malawi	180	1	220	1	170	1	30
24 Mali	240	2	280	2	160	1	76
25 Morocco	930	8	1,230	7	620	4	99
26 Netherlands	12,030	100	15,820	94	9,420	56	68
27 Nigeria	920	8	880	5	850	5	4
28 Norway	12,900	107	19,190	114	14,560	86	32
29 Pakistan	290	2	440	3	370	2	19
30 Philippines	650	5	690	4	540	3	28
31 Poland	NA	NA	NA	NA	NA	NA	NA
32 Portugal	2,380	20	3,100	18	1,980	12	57
33 Senegal	510	4	650	4	380	2	72
34 Spain	5,370	45	7,150	42	4,360	26	64
35 Sri Lanka	260	2	400	2	390	2	3
36 Tanzania	NA	NA	NA	NA	NA	NA	NA
37 Tunisia	1,280	11	1,770	11	1,180	7	50
38 United Kingdom	7,980	66	11,200	67	8,500	50	32
39 United States	12,020	100	16,830	100	16,880	100	0
40 Yugoslavia	3,250	27	4,090	24	2,060	12	99
41 Zambia	600	5	650	4	370	2	76
42 Zimbabwe	710	6	930	6	640	4	46
					Average		47
					Abs. average		47
					Range		0 to +99

Source: 1980 and 1985 actuals are from latest World Bank files.
1985 estimated values are derived by extrapolating 1980 actuals by per capita GDP growth rates computed from constant price national accounts data and scaling up the results by US inflation measured by implicit GDP deflator.

ANNEX TABLE: 6

Comparison of Extrapolated and Actual Per Capita GNP in US Dollars
Based on Atlas Conversion, 1990

	Actual US$ 1985 1	Actual US=100 1985 2	Extrapolated US$ 1990 3	Extrapolated US=100 1990 4	Actual US$ 1990 5	Actual US=100 1990 6	Difference (%) Col.4 over col.6 7
1 Australia	11,760	70	14,480	66	16,560	76	-13
2 Austria	9,100	54	12,190	55	19,090	87	-36
3 Belgium	8,280	49	11,260	51	17,580	81	-37
4 Canada	14,230	84	18,370	83	20,380	93	-11
5 Denmark	11,380	67	14,350	65	22,440	103	-37
6 Finland	11,040	65	15,100	69	24,540	113	-39
7 France	9,810	58	13,170	60	19,590	90	-33
8 Germany	10,920	65	14,570	66	22,363	103	-35
9 Greece	3,700	22	4,640	21	6,010	28	-24
10 Ireland	4,940	29	7,270	33	10,370	48	-31
11 Italy	7,750	46	10,470	48	16,880	77	-39
12 Japan	11,430	68	16,420	75	25,840	118	-37
13 Luxembourg	14,080	83	19,860	90	29,010	133	-32
14 Netherlands	9,420	56	12,260	56	17,570	81	-31
15 New Zealand	6,910	41	8,020	36	12,570	58	-37
16 Norway	14,560	86	17,590	80	22,830	105	-24
17 Portugal	1,980	12	2,840	13	4,950	23	-43
18 Spain	4,360	26	6,300	29	11,010	50	-43
19 Sweden	12,020	71	15,260	69	23,780	109	-36
20 Turkey	1,080	6	1,520	7	1,640	8	-8
21 United Kingdom	8,500	50	11,530	52	16,080	74	-29
22 United States	16,880	100	22,020	100	21,810	100	0
					Average		-30
					Abs. average		30
					Range		0 to -43

Source: 1985 and 1990 actuals are from latest World Bank files.
1990 estimated values are derived by extrapolating 1985 actuals by per capita GDP growth rates computed from constant price national accounts data and scaling up the results by US inflation measured by implicit GDP deflator.

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